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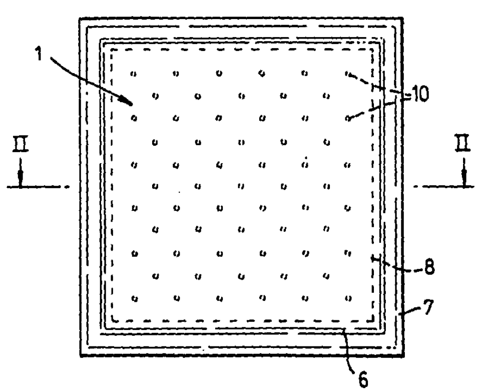
(54) **Sheet-like article.**

(57) A sheet-like article suitable, for example, for wiping hard surfaces, comprises two sheets of nonwoven fabric or the like having sandwiched between them a solid core material which may be a highly porous, optionally liquid-containing, polymer. The two outer sheets are bonded to each other, without involving the core material, by means of a plurality of small, spaced bonding points, for example, spot-welds. Preferably the core material is in continuous sheet form and is perforated to accommodate the bonding points.



EP 0 112 654 A2

SHEET-LIKE ARTICLE

The present invention relates to a laminated flexible sheet-like article suitable for wiping a surface, for example, the surface of a household or industrial object, or the human skin, in order either to deliver a liquid active material to that surface or to pick up liquid from that surface; or for gradually releasing an active material, such as a bubble bath composition, an air-freshener or a perfume, without surface contact. The article includes a solid core material, for example a highly porous polymer containing a liquid active material such as a detergent or a skin treatment material, sandwiched between outer layers of web or sheet material.

EP 68 830 (Unilever) discloses an article suitable for delivering or absorbing a liquid, the article comprising a substrate carrying a pressure-sensitive porous polymeric material capable of retaining at least 5 times, and preferably at least 10 times, its own weight, defined in terms of water, of liquid, and of releasing at least some of that liquid on the application thereto of hand pressure, the porous polymeric material being dry or containing an aqueous or non-aqueous liquid.

Within that generic concept are two possibilities: the porous polymeric material may be dry, to give an article useful for mopping up liquid spillages, or it may

carry a liquid which can be expressed from the article by the application of hand pressure. In some cases the polymer may contain 40 times its own weight of liquid, yet feel dry to the touch.

One class of polymers that has been found highly effective in this type of article is constituted by the polymerisation products of high internal phase emulsions, in particular styrene-based polymers. EP 60 138 (Unilever) discloses and claims a class of such polymers.

In preparing sheet-like or cloth-like articles incorporating these porous polymers difficulties have been experienced owing to the fact that these polymers are not, in general, readily bonded either by heat-sealing or by means of an adhesive. Thus a sheet of liquid-carrying polymer cannot simply be sandwiched between two layers of heat-sealable nonwoven fabric or the like and the whole bonded together by heat-sealing or adhesive to form a composite cloth-like article. If the edge regions only are heat-sealed together the porous material in the middle is not located with respect to the outer layers and can move about, resulting in crumpling or or even, with some polymers, cracking.

According to a proposal described in EP 66 463 (Unilever) individual squares of polymer or other porous material may be located in individual cells of a sandwich structure obtained by bonding together two outer layers of nonwoven fabric or the like in a grid or similar pattern. This arrangement, while having excellent feel and giving the possibility of controlled release of liquid at different rates from different cells, has the disadvantage that assembly is difficult and slow; the squares of polymer must be accurately positioned with respect to the outer layers before bonding.

According to the present invention, a sheet-like or cloth-like article in which an intermediate material is sandwiched between two outer sheet substrates can be produced in which the layers are held together in register, using a simple method of assembly.

The present invention accordingly provides a flexible sheet-like article suitable for use as a wiping cloth and/or for delivering an active material (as hereinafter defined), the article comprising first and second sheet substrates, at least one being liquid-permeable, and, sandwiched between them, an intermediate layer of solid core material comprising absorbent and/or active (as hereinafter defined) material, the first and second substrates being bonded to one another, without involving the intermediate layer, at a plurality of locations of relatively small area distributed relatively uniformly over the area of the article.

The bonding may be by any suitable means. An adhesive may if desired be used, but bonding of the substrates themselves by a welding method, such as heat-sealing or ultrasonic welding, is especially preferred. In this case it is necessary for both the outer layers (first and second sheet substrates) to consist at least partially of thermoplastic material. Spot-welding is an especially convenient method of producing the small bonding points required according to the invention.

The nature of the core material forming the intermediate layer will depend on the intended use of the article. It may for example be a highly absorbent material, when the article is intended for use as a wiping cloth for mopping up liquid spillages and the like. On the

other hand, the primary purpose of the article of the invention may be the delivery of a cleaning composition, disinfectant, skin treatment agent or other beneficial material, referred to generically in the present specification as an "active" material. In this case the core material will consist wholly or partially of such an active material, and may also include a carrier, for example a porous polymer, by means of which delivery of the active material may be controlled. The active material may be in liquid or solid form, but if the active material is a liquid the use of a solid carrier is necessary.

According to one preferred embodiment of the invention, the intermediate layer is in continuous sheet form and is provided with a plurality of relatively small perforations through which the first and second sheet substrates are bonded together.

Conveniently the bonding points, for example spot welds, are substantially circular, and the perforations through which they are made are small substantially circular orifices. In principle, however, the bonding points and the corresponding perforations in the intermediate layer may be of any shape provided that they are of small area in comparison with the area of the sheet.

Preferably the bonding points are spaced so as to form a regular pattern. The distance between adjacent bonding points should not be too small, to allow the major part of the area of the article to be available for performing its function of taking up liquid, soil etc. and/or delivering active material. Equally, the spacing should not be too large, or the layers will not be adequately held in register with one another. Advantageously the minimum spacing between two adjacent bonding points on the article is within the range of from 5

to 100 mm, preferably from 10 to 60 mm and more preferably from 15 to 50 mm.

In the addition to the small bonding points distributed over the whole sheet, it will generally be necessary for the article to be closed along the edges by bonding together the edge regions of the first and second sheet substrates. In the case where the intermediate layer is in continuous sheet form, these sheet substrates should be slightly larger than the intermediate layer.

The first and second sheet substrates may be of any suitable flexible sheet material, and may be of the same or of different materials, the only prerequisite being that at least one, preferably both, is or are liquid-permeable: it is essential that liquid can pass out of or into the intermediate layer. In the case of a dry, absorbent article (wiping cloth), spilt liquid mopped up must have access to the absorbent core material; in the case of a core of solid active material, the article will need to be wetted before use and water will need to penetrate to the active material and dissolve or disperse it out; and in the case of a liquid active material, that material will need a means of egress from the core. Thus at least one of the first and second sheet substrates will need to be permeable to liquid, i.e. inherently liquid-permeable and/or provided with openings.

Advantageously one or both substrate layers comprise paper or nonwoven fabric. If heat-sealability is required, this may be derived from the presence of a proportion of thermoplastic fibres in the main substrate material, or from the presence of an additional layer or coating of thermoplastic material. This may take the form, for example, of a layer of lightweight thermoplastic nonwoven fabric, or a continuous or discontinuous coating of

thermoplastic sheet or film material. If a continuous layer or coating is present it must be perforated to allow liquid to pass through. In the finished article, the coated side will of course be innermost.

A material, that may be advantageously used for both first and second substrate layers, is a porous, bulky, lofty paper or nonwoven fabric of high void volume, coated on the inner side with polyethylene film pinholed at suitable intervals.

The use of relatively absorbent material for the substrate layers is of particular advantage for an article of the invention to be used for wiping a surface in order, for example, to clean, polish, disinfect, or medically or cosmetically treat, that surface.

As previously indicated, in one embodiment of the invention the intermediate layer comprises a porous carrier material containing a liquid active material which can be any liquid that can be usefully and beneficially delivered by a sheet-like article according to the invention. The liquid may be hydrophobic or hydrophilic. Examples of such liquids include soap and detergent compositions, bleach, disinfectant, bubble bath and shower preparations, air fresheners, skin treatment agents, dry cleaning solvents, perfumes, and many more.

The porous carrier material may consist of any suitable material having adequate absorbency of liquids. It may, for example, be a conventional plastics foam. Preferably, however, the porous material is capable of retaining liquid as well as absorbing it. A preferred carrier material is a porous polymer capable of retaining at least 5 times its own weight of liquid, defin d in terms of water, and of releasing at least some of that liquid on

the application of hand pressure. A polymer capable of retaining at least 10 times, preferably at least 25 times and more preferably at least 40 times, its own weight of liquid, is especially advantageous. The liquid preferably constitutes at least 90%, more preferably at least 95%, of the weight of the polymer and liquid together. Details of suitable polymers are given in EP 68 830 (Unilever).

The porous polymer preferably has a pore volume greater than 9 cc/g, more preferably greater than 15 cc/g.

The dry density of the polymer is preferably less than 0.1 g/cc, more preferably within the range of from 0.03 to 0.08 g/cc. This is the density of the material when its pore system contains air. Some polymers according to the invention, however, cannot exist in the dry state; they are prepared by methods which leave the pore system full of liquid, and this liquid can if desired be exchanged for another liquid, but if dried their pore system collapses.

In a preferred embodiment of the invention, the polymer is the polymerisation product of a high internal phase emulsion having an aqueous internal phase, and a continuous phase comprising one or more polymerisable hydrophobic monomers. It is especially preferred that the aqueous internal phase constitutes 90% or more by weight, preferably at least 95% by weight, of the emulsion. Polymers of this type are described in more detail in EP 60 138 and EP 68 830 (Unilever). If a single monomer is used, it must be hydrophobic; a monomer mixture must be predominantly hydrophobic. Vinyl polymers are of especial interest, styrene homo- and copolymers being especially preferred. Light cross-linking is of advantage in improving both the capacity for absorption and retention of liquids and the dimensional stability. Two types of

polymers that have been found useful are polystyrenes lightly cross-linked with divinyl benzene, and styrene/butyl methacrylate copolymers lightly cross-linked with allyl methacrylate.

A porous polymer as disclosed in the four preceding paragraphs has the advantage that liquid contained in it remains enclosed within the polymer unless expressed by the application of hand pressure; the liquid-containing polymer can consist of liquid to an extent of 98% by weight or more while feeling virtually dry to the touch. Thus an article containing a high proportion by weight of entrapped liquid can be produced.

The article can remain dry during handling and storage, until the liquid in the polymer is released at the point of use by the application of pressure. It is also within the scope of the invention for the article to be wet, for example, impregnated, either with the liquid contained in the polymer or with a different liquid. If a second liquid is present, this may not necessarily be compatible with the first, since mixing will not occur until the polymer is squeezed in use. One or more further liquids may if desired be present in microencapsulated form. This is especially advantageous in the case of mutually incompatible liquids.

In one particular preferred embodiment of the invention, the sheet-like article of the invention is intended for application to reflective household surfaces such as mirrors, windows, tiles, paintwork and furniture to give a substantially streak-free finish. Such an article has the advantage that it can be applied directly to the surface to be cleaned; the surface need only wiped over and then allowed to dry. No additional liquid and no cloths or

tissues are required; thus contamination by streak-forming impurities is eliminated.

In this embodiment the liquid in the void system of the porous polymer is a homogeneous aqueous liquid composition having a surface tension of less than 45 mNm^{-1}, preferably less than 35 mNm^{-1}, which composition, when applied to a surface and allowed to dry, dries substantially without forming discrete droplets or particles larger than 0.25 µm, preferably 0.1 µm. The liquid preferably contains a surface-active agent, more preferably a nonionic surface-active agent, at a relatively low concentration, and a lower aliphatic alcohol, preferably ethanol or isopropanol; a film forming polymer may also be present. Suitable liquid compositions are described in detail in EP 67 016 and EP 68 830 (Unilever).

An article according to the invention will now be described in more detail, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a plan view of the article,

Figure 2 is a section along the line II-II in Figure 1, and

Figure 3 is an enlarged view of part of Figure 2.

Referring now to Figures 1, 2 and 3, the article 1 comprises first and second substrates 2 and 3 each of which consists of an outer layer of bulky, lofty, wet-strength paper 4 and an inner coating 5 of polyethylene. These are heat-sealed together in their edge regions, by means of the polyethylene coatings 5, along the lines 6 and 7.

Sandwiched between the substrates 2 and 3 is an intermediate layer 8 of flexible, highly porous polymeric material carrying a liquid. The layer 8 has a regular pattern of relatively small perforations 9 over its whole area, and the substrates 2 and 3 are bonded together by a spot weld 10 through each perforation 9. The spacing between adjacent spot-welds is 30 mm.

The polyethylene coating 5 on each substrate 2 or 3 is provided with pinholes 11 for the passage of liquid from the porous polymer 8.

The polyethylene-coated substrates could if desired be replaced by uncoated substrates of nonwoven fabric having a sufficient proportion of thermoplastic fibres for heat-sealability, or by non-thermoplastic substrates provided with a covering layer of light-weight thermoplastic nonwoven fabric. Pinholes would not then be necessary because the liquid could pass through the nonwoven fabric(s).

The article feels to the hand like a fairly bulky cleaning cloth such as a chamois leather. In use, it is squeezed to express a suitable amount of liquid through the pinholes 11.

The sheet-like article of the invention may be used for many purposes, for example, hand and face cleaning; skin treatment other than cleaning (for example anti-acne treatment); baby hygiene; cleaning, polishing, disinfecting or deodorising industrial and domestic surfaces (for example, windows, paintwork, machinery, carpets, clothing, shoes); air freshening and perfume delivery; and hospital hygiene. Other possible uses will readily suggest themselves to the worker skilled in the art.

* * * * *

CLAIMS

1. A flexible sheet-like article comprising first and second sheet substrates, at least one of which is liquid-permeable, having sandwiched between them an intermediate layer of solid core material comprising absorbent and/or active (as hereinbefore defined) material, characterised in that the first and second substrates are bonded to one another, without involving the intermediate layer, at a plurality of locations of relatively small area distributed relatively uniformly over the area of the article.

2. An article according to claim 1, characterised in that the core material is in the form of a continuous sheet provided with a plurality of relatively small perforations through which the first and second sheet substrates are bonded together.

3. An article according to claim 1 or claim 2, characterised in that the first and second sheet substrates consist at least partially of thermoplastic material and are bonded together by heat-sealing.

4. An article according to any one of claims 1 to 3, characterised in that the minimum distance between any two bonding locations is within the range of from 5 to 100 mm.

5. An article according to any one of claims 1 to 4, characterised in that the core material comprises a pressure-sensitive porous polymeric material capable of retaining at least 5 times its own weight, defined in terms of water, of liquid and of releasing at least some of said liquid on the application thereto of hand pressure, the porous polymeric material being dry or containing an aqueous or non-aqueous liquid.

6. An article according to claim 5, characterised in that the porous polymeric material is capable of retaining at least 25 times its own weight of liquid, defined in terms of water.

7. An article according to claim 5 or claim 6, characterised in that the porous polymeric material is the polymerisation product of a high internal phase emulsion having an aqueous internal phase.

8. An article according to any one of claims 1 to 7, characterised in that the core material comprises a porous material containing a liquid which constitutes at least 90% of the weight of the liquid and the porous material together.

9. An article according to any one of claims 1 to 8, characterised in that one or both of the first and second substrate layers comprises paper or nonwoven fabric having a coating of thermoplastic material, said coating if continuous being provided with pinholes for the passage of liquid.

10. An article according to any one of claims 1 to 9, characterised in that the porous material of the intermediate layer contains a homogeneous aqueous liquid composition having a surface tension of less than 45 mNm^{-1}, which composition, when applied to a surface and allowed to dry, dries substantially without forming discrete droplets or particles larger than 0.25 μm.

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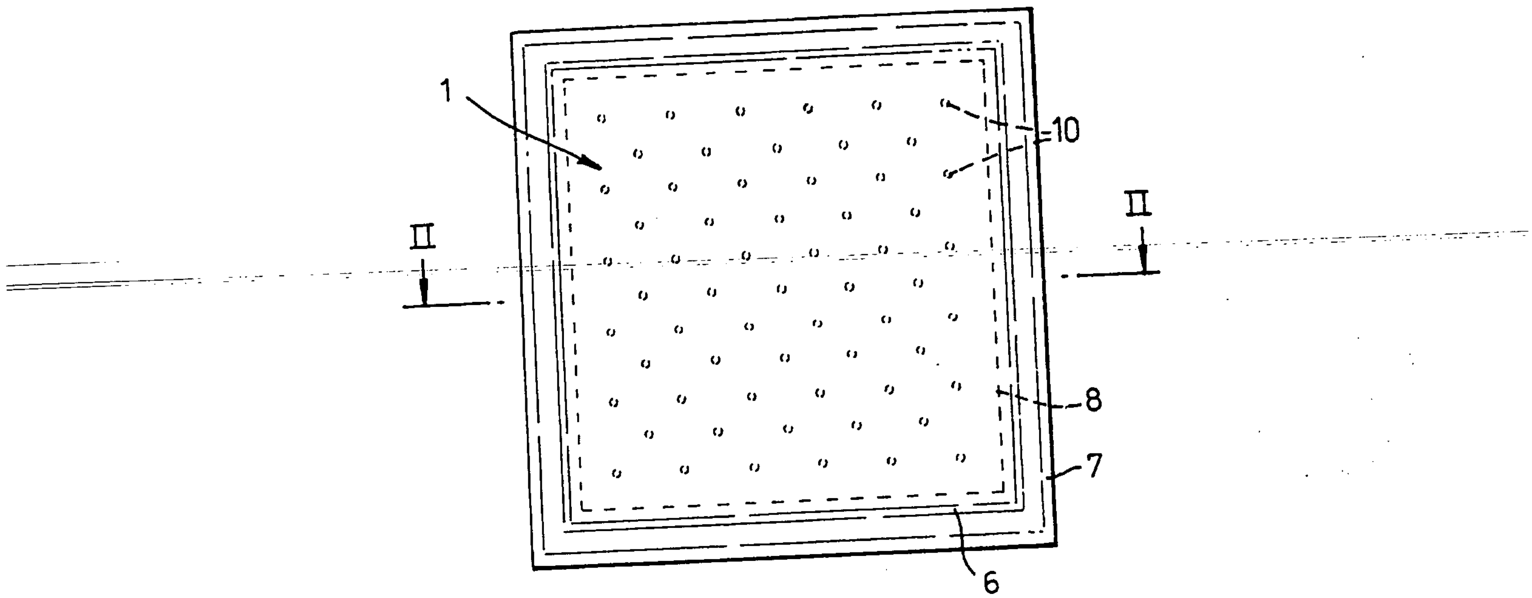

Fig.1.

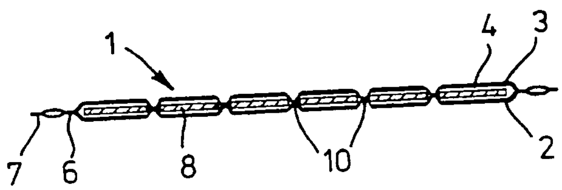

Fig. 2.

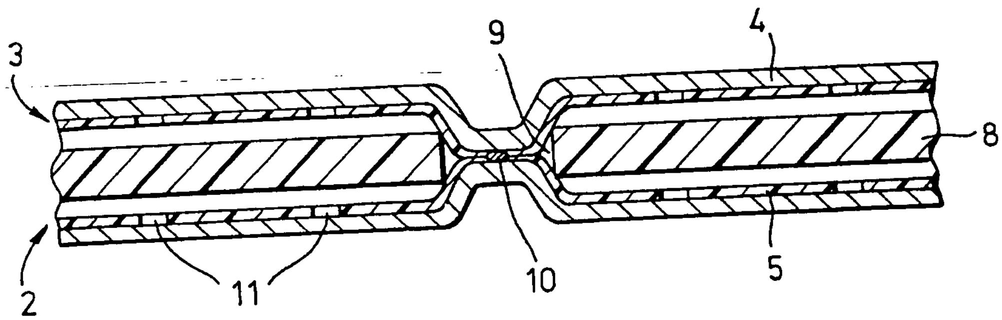

Fig. 3.

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(54) **Elastic thermal bonded non-woven fabric.**

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The invention relates to a process for producing an elastic thermal bonded non-woven fabric, and to the fabric that is produced by said process.

Background to the Invention

Non-woven fabrics having elastic properties in one direction have enhanced utility for applications such as facing layers for sanitary napkins, diapers, and the like, wherein the elasticity of the fabric provides a "give" in the fabric so that the facing sheet will more readily conform to changes in the shape of the object in response to bodily movement. This invention provides a lightweight, non-woven fabric having elasticity in one direction, and hence the fabric of the invention has enhanced utility for such applications.

Brief Summary of the Invention

The invention provides a process which comprises:

(a) bonding a web of fusible staple fibers by thermal embossing in an intermittent pattern; and

(b) stretching the bonded web at elevated temperature,

to thereby produce a fabric having elastic properties in the direction perpendicular to the direction of the stretch.

The Prior Art

Ness, in U.S. Patent No. 3,485,695, discloses a multi-step process for producing a nonwoven fabric having unidirectional elasticity. The steps in the Ness patent are the following:

1. Forming a fibrous web;
2. Rearranging the fibers in the web to form a fibrous web having staggered pores;
3. Bonding the web;
4. Drying the bonded web;
5. Drafting the dried, bonded web to elongate said pores;
6. Applying the elastomeric binder to the drafted web; and
7. Drying and setting the elastomeric binder.

Ostermeier, in U.S. Patent No. 3,949,128, discloses a nonwoven fabric having bi-directional elasticity. The fabric is composed of spot-bonded continuous and randomly deposited filaments.

Brief Summary of the Drawings

Fig. 1 is a side elevation, partially schematic, of one arrangement of apparatus suitable for carrying out the process of the invention;

Fig. 2 is a top plan view, partially schematic, of another arrangement of apparatus suitable for carrying out the process of the invention;

Fig. 3 shows the embossed pattern for the surface of an embossed calender roll suitable for use in the process of the invention;

Fig. 4 is a cross-section taken along lines 4-4 of Fig. 3;

Fig. 5 shows the pattern of the surface of another embossed calender roll suitable for use in the invention; and

Fig. 6 is a cross-section taken along line 6-6 of Fig. 5.

Detailed Description of the Invention

Referring first to Fig. 1, one preferred arrangement of apparatus for carrying out the process of the invention is shown. A web 10 of staple length fusible fibers is fed, as by an endless belt 14, to a calender 12 composed of two rolls 16, 18. The upper roll 16 has an embossed intermittent pattern (which will be described in more detail below), and the lower roll 18 is a smooth back-up roll. Both rolls are heated to a temperature such that the fusible fibers comprising the web 10 are heated to their thermal bonding temperature. Thus, as the web 10 passes through the calender 12, it is thermally bonded in an intermittent pattern corresponding to the embossed pattern of the upper roll 16. The thermally bonded web 20 then proceeds past a set of rolls 22, 23 that are driven at the same circumferential speed as the calendar rolls 16, 18, through an oven 24, and finally to a windup 26. The windup 26 is being driven at a speed such that its circumference is moving faster than the speed of the circumference of the two rolls 16, 18 comprising the calender 12. Therefore, the thermal bonded fabric 20 is stretched in the machine direction as it passes through the oven. Upon cooling, the thus produced fabric 28 will have elastic properties in the cross direction, i.e., the direction transverse to that of the stretch.

Referring now to Fig. 2, an alternate arrangement of apparatus for carrying out the process of the invention is shown. As with the apparatus discussed in connection with Fig. 1, a web 10 of staple length fusible fibers is fed to a calender 12, composed of an embossed roll 16 and a smooth backup roll (not shown). The calend r is heated to a temperture such that the fusible fibers comprising the web 10 are heated to their thermal bonding temperature, so that the fabric is thermal bonded in a pattern corresponding to the pattern of the embossed roll 16, which is an intermittent pattern. The thermal bonded web 20 has a width, W1, after having been thermal bonded. The thermal bonded web 20 is then fed to a

heated tenter frame 30, wherein the bonded web 20 is heated and stretched in the cross direction as it passes through the tenter frame 30. After passing through the tenter frame 30, the width, W2, of the fabric 32 will be slightly greater than the width, W1 of the fabric 20 as it was fed into the tenter frame 30. The fabric 32, after it cools, will then have elastic properties in the machine direction (i.e., in the direction of the arrow "a"), which is the direction transverse to that to which the fabric was stretched while being heated.

The processes described above are preferred embodiments of the invention wher in the fabric is thermally bonded and then stretched (while being heated) to impart elasticity, in one continous operation. However, if desired, the fabric may be thermal bonded, collected, and in a subsequent operation, may then be stretched (while being heated) to impart elasticity to the web.

The fibers that are employed in the invention are heat fusbible fibers such as polypropylene fibers, highly density polyethylene fibers, polyester fibers, or conjugate fibers having an outer layer of a heat fusible material such as sheath/core polyethylene/propylene fibers having a sheath of polyethylene and a core of polypropylene, and sheath/core polyethylene/polyester fibers having a sheath of polyethylene and a core of polyester. Such heat fusible fibers are commercially available. The fibers that are employed are of staple length, that is, they are usually in excess of about one-half inch in length, up to about three or four inches long. They usually have a denier within the range from about one to about six.

Fibers that are not normally heat-fusible can be used in admixture with the heat-fusible fibers, in minor amounts. Such other fibers include rayon, cotton, wood pulp, and the like.

The feed web 10 employed in the invention is preferably a random web of staple fibers. Random webs are made by known procedures, such as by employing a RANDO WEBBER, or a dual rotor, such as is described by Ruffo and Coyal in U.S. Patent No. 3,768,118. The feed web can weigh, for instance, from about 0.3 to about six ounces per square yard. The exact weight of the feed web has not been found to be narrowly critical.

While the use of random webs is preferred, oriented webs such as card webs can also be used in the invention. When oriented webs are used, in most cases the direction of stretch will be in the direction of fiber orientation (i.e., usually in the machine direction), because the oriented web is usually not strong enough in the direction perpendicular in the orientation to support tension in that (perpendicular) direction.

The thermal bonding of the fibers in the feed web is carried out at an embossed bonder, such as is illustrated in the drawings. The bonder has one roll that has a raised intermittent pattern on its surface, with the other roll being a smooth back-up roll. The temperature at which the thermal bonding is carried out, of course, is dependent upon the nature of the fusible material in the feed web, as well as the weight of the web and the speed of the web through the binder, For instance, at very high speeds, it may be desirable to use a pre-heater in order to heat up the web to close to the bonding temperature just prior to its entrance into the bonder. The bonding temperature of the web is particularly determined by the nature of the material that is thermally bondable. For instance, if the fusible material is high density polyethylene, as it will be in a conjugate fiber having a sheath of high density polyethylene, the bonding temperature is usually within the range of from about 100° to about 150°C. If the fusible material in the web is polypropylene, the bonding temperature is usually from about 130°C to about 190°C. However, the exact bonding temperature is not narrowly critical. The important thing is that the temperature be sufficiently high to soften the fiber so that the pressure from the bonder will cause adhesion of the fusible fibers to one another in a pattern corresponding to the pattern of the embossed roll.

Figs. 3 and 4 illustrate a typical intermittent embossed pattern (a diamond pattern) that is suitable for use in the invention. The exact dimensions of one embodiment of the pattern are given below in the examples. In a preferred way of carrying out the invention, one axis of the diamond pattern is slightly longer than the other axis. In such a case, where the fabric is stretched, it is preferably stretched in the direction of the longer of the two axes.

Other intermittent patterns can also be used in the invention, as is illustrated by the embossed pattern shown in Figs. 5 and 6. The only requirement is that there be alternating areas of bonded and unbonded fibers. Thus, overall bonded thermal bonded fabrics cannot be used in the invention.

The pressure on the calender bonder has not been found to be narrowly critical. It will normally be within the range of from about 18 to about 850 pound per linear inch.

After having been thermal bonded, the bonded fabric is then subjected to a stretch while being heated. A stretching of from about 5% up to perhaps 40% or 50% is feasible, although a stretching of from about 15% to about 30% is preferred. As was discussed above, the stretching can either be in the machine direction, which is more readily carried out because the equipment therefor is less expensive, or it can be in cross direction if one employs a heated tenter frame to do the stretching. While the fabric is being stretched, it is also subjected to elevated temperature, of from, for example, about 100° to about 160°C. The exact temperature to which the fabric is heated while being stretched depends upon the nature of the fusible fiber in the fabric, since the temperature should be about the softening point of the fiber.

The examples below illustrated the practice of the invention.

Example 1

A random laid web of staple fibers was employed in this example. The web was composed of 75 w ight per cent of 3 denier polypropylene fibers having a staple length of one and one-half inches, and 25 weight per cent of 1.5 denier polyester fibers having a staple length of one and one-half inches. The total

base web weight was 60 grams p r square meter, or 1.77 ounces per squar yard. This web was subj cted to thermal emboss bonding using an mboss bonder having a raised emboss pattern as shown in Figs. 3 and 4. The raised emboss lines 40 were in a diamond pattern, with the dimensions "A" being 5.5 millimeters, the dimesions "B" being 0.8 millimeter, and the dimension "C" being 0.035 millimeter. The angles "D" were 30°C.

In Example 1, the long axis of the diamond was oriented in the cross direction. The above-described web was fed through the emboss bonder, which was heated to a temperature of 165°C. The pressure on the web as it passed through the emboss bonder was 270 pounds per linear inch.

After having been thermally emboss bonded, the web was passed through a heated tenter frame where it was stretched to a final width, W2, that was 125% of the unstretched width, W1 (See Fig. 2). The tenter frame was maintained at a temperature of 140°C.

The properties of the resulting fabric, both before stretching and after stretching, are displayed below in Table I:

TABLE I

	Before Stretching	After Stretching	Variation
Weight, oz/yard²	1.77	2.21	+25%
Tensile strength, CD, pounds per inch, 12 ply	39.5	62.1	+57%
Tensile strength, MD, pounds per inch, 12 ply	15.5	11.65	−25%
CD elongation before breaking, per cent	19.2	9.6	−50%
MD elongation before breaking, per cent	16.8	74.4	340%

Example 2

In this example, a web similar to that employed in Example 1 was used, except that it had basic weight of 25 grams per square meter (0.74 ounces per square yard). In this example, the emboss pattern was the same as that used in Example 1, except that the long axis of the diamond pattern was oriented in the machine direction.

The web was fed through the emboss bonder at a speed of 10 yards per minute, with the emboss bonder being maintained at a temperature of 160°C. The pressure on the web going through the bonder was 360 pounds per linear inch. In this example, the windup batcher was run at a speed of 12.5 yards per minute, which is 125 per cent of the speed of the web that was fed into the emboss bonder. In between the emboss bonder and the batcher, there was an oven, in which the web was heated to a temperature of 140°C.

The properties of the fabric so produced are shown in Table II:

TABLE II

	Before Stretching	After Stretching	Variation
Weight (oz per square yard)	0.67	1.06	+44%
Tensile strength, CD, pounds/inch, 12 ply	12.94	6.73	−48%
Tensile strength, MD, pounds/inch, 12 ply	27.19	41.4	+52%
CD elongation before breaking, per cent	37.2	91.2	−145%
MD elongation before breaking, per cent	14.4	7.2	−50%

In Examples 1 and 2, the increased elasticity in the direction transverse to which the web was stretched is shown in the markedly increased elongation in that direction. The fabrics produced by this invention have enhanced utility as facing fabrics for articles such as sanitary napkins, disposable diapers, bandages, and the like, in which a degree of stretch in one direction is useful in order to help permit the article having the fabric as a facing fabric to conform more readily to bodily movement.

Example 3

The procedure of Example 2 was repeated, except that the 75% polypropylene/25% polyester fibrous feed web was a carded web weighing 0.67 ounces per square yard.

The web was fed through the emboss bonder at a speed of 10 yards per minute with the emboss bonder being maintained at a temperature of 150°C, The pressure on the web going through the bonder was 200 pounds per linear inch, In this example, the windup batcher was run at a speed of 13 yards per minute, which is 130 per cent of the speed of the web that was fed into the emboss bonder. In between the emboss bonder and the batcher, there was an oven, in which the web was heated to a temperature of 120°C.

The properties of the fabric so produced are shown in Table III:

TABLE III

	Before Stretching	After Stretching	Variation
Weight (oz per square yard)	0.67	1.41	+110%
Tensile strength, CD, pounds/inch, 12 ply	2.65	2.2	−17%
Tensile strength, MD, pounds/inch, 12 ply	43.65	72.7	−67%
CD elongation before breaking, per cent	50.4	135.6	+169%
MD elongation before breaking, per cent	8.4	6	−29%

Example 4

The procedure of Example 2 as repeated, except that the 75% polypropylene/25% polyester feed web was a random web weighing 0.67 ounces per square yard, and the calender employed a roll that was embossed in the dash pattern shown in Figs. 5 and 6, wherein the axis "y" was oriented in the machine direction, and the several dimensions were the following:

g = 0.5 millimeter (0.02 inch)
p = 1 millimeter (0.04 inch)
q = 5 millimeters (0.2 inch)
r = 2 millimeters (0.08 inch)
s = 3 millimeters (0.12 inch)

The web was fed through the bonder at a speed of 12 yards per minute, with the bonder being maintained at a temperature of 150°C. The pressure on the web going through the bonder was 200 pounds per linear inch. In this example, the windup batcher was run at a speed of 15 yards per minute, which is 125 per cent of the speed of the web that was fed into the binder. In between the bonder and the batcher, there was an oven, in which the web was heated to a temperature of 130°C.

The properties of the fabric so produced are shown in Table IV:

TABLE IV

	Before Stretching	After Stretching	Variation
Weight (oz per square yard)	0.67	1.39	+107%
Tensile strength, CD, pounds/inch, 12 ply	11.9	6.6	−45%
Tensile strength, MD, pounds/inch, 12 ply	18.52	29.76	+60%
CD elongation before breaking, per cent	25.2	87.6	+247%
MD elongation before breaking, per cent	15.6	7.2	−54%

Claims

1. Process which comprises stretching, at elevated temperature, a thermally bonded web wherein the thermal bonds are in an intermittent pattern, and then cooling the stretched web, to thereby produce a

fabric having elastic properties in the direction perpendicular to the direction of stretch.

2. Process which comprises the steps of:

(a) bonding a web of fusible staple fibres by thermal bonding in an intermittent pattern;

(b) stretching the bonded web at elevated temperature; and

(c) cooling the stretched web,

to thereby produce a fabric having elastic properties in the direction perpendicular to the direction of stretch.

3. The process of claim 1 to claim 2 wherein said web of fusible staple fibers is a randon web.

4. The process of any of claims 1 to 3 wherein said intermittent pattern is a diamond pattern.

5. The process of any of claims 1 to 3 wherein said intermittent pattern is a dash pattern.

6. The process of any of claims 1 to 5 wherein the fusible fibers are polypropylene, polyethylene, polypropylene/polyethylene conjugate fibers, or polyester/polyethylene conjugate fibers.

Patentansprüche

1. Verfahren, welches das Verstrecken einer thermisch gebundenen Bahn, in welcher die thermischen Bindungen in einem intermittierenden Muster vorliegen, bei erhöhter Temperatur und das anschließende Kühlen der verstreckten Bahn umfaßt, um dadurch einen Stoff mit elastischen Eigenschaften in derjenigen Richtung, die zu de Richtung des Verstreckens senkrecht verläuft, zu erzeugen.

2. Verfahren, welches die folgenden Schritte umfaßt:

(a) Binden einer Bahn aus schmelzbaren Stapelfasern durch thermisches Binden in einem intermittierenden Muster;

(b) Verstrecken der gebundenen Bahn bei erhöhter Temperatur und

(c) Kühlen der verstreckten Bahn, um dadurch einen Stoff mit elastischen Eingenschaften in derjenigen Richtung, die zu der Richtung des Verstreckens senkrecht verläuft, zu erzeugen.

3. Verfahren nach Anspruch 1 oder Anspruch 2, wobei die Bahn aus schmelzbaren Stapelfasern eine nicht orientierte Bahn ist.

4. Verfahren nach einem der Ansprüche 1 bis 3, wobei das intermittierende Muster ein Rhombenmuster ist.

5. Verfahren nach einem der Ansprüche 1 bis 3, wobei das intermittierende Muster ein Strichemuster ist.

6. Verfahren nach einem der Ansprüche 1 bis 5, wobei die schmelzbaren Fasern Polypropylen- oder Polyethylenfasern oder Polypropylen/Polyethylen-Konjugatfasern oder Polyester/Polyethylen-Konjugatfasern sind.

Revendications

1. Procédé qui consiste à étirer à une température élevée une bande thermiquement liée dans laquelle les liaisons thermiques sont en un motif intermittent et, ensuite à refroidir la bande étirée pour produire ainsi une étoffe possédant des propriétés élastiques dans le sens perpendiculaire à celui de l'étirage.

2. Procédé qui consiste:

(a) à lier une bande en fibres discontinues fusibles par liaison thermique en un motif intermittent;

(b) à étirer la bande liée à une température élevée; et

(c) à refroidir la bande étirée pour ainsi produire une étoffe possédant des propriétés élastiques dans le sens perpendiculaire à celui de l'étirage.

3. Procédé selon la revendication 1 ou 2, dans lequel ladite bande de fibres fusibles discontinues est une bande statistique.

4. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel ledit motif intermittent est une motif en losange.

5. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel ledit motif intermittent est un motif en tirets.

6. Procédé selon l'une quelconque des revendications 1 à 5, dans lequel les fibres fusibles sont en polyproylène, polyéthylène, des fibres conjuguées polypropylène/polyéthylène ou des fibres conjuguées polyester/polyéthylène.

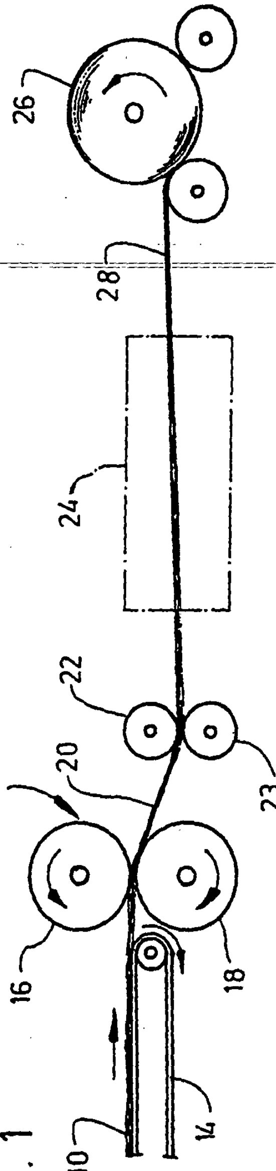

FIG. 1

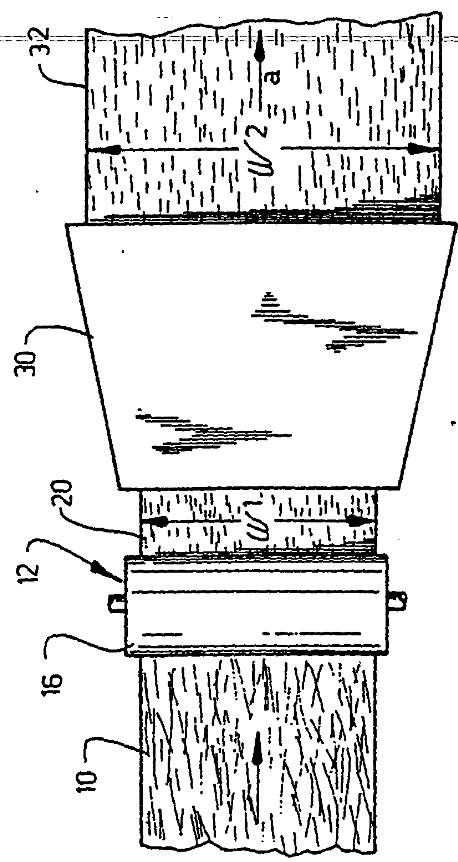

FIG. 2

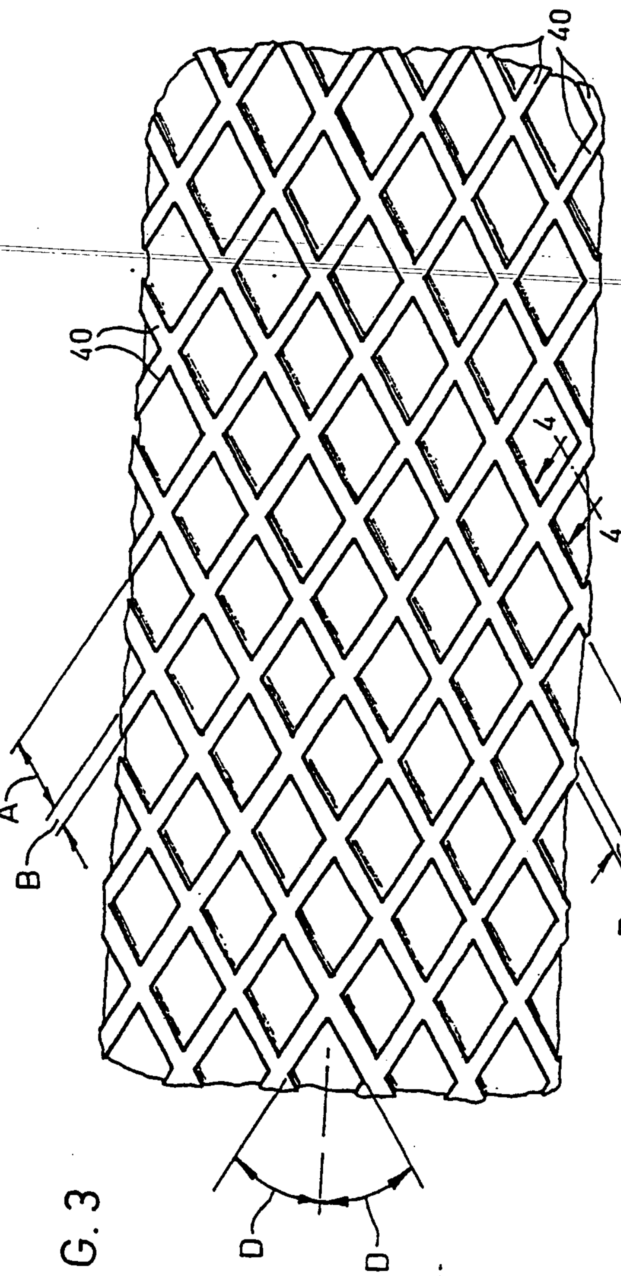

FIG. 3

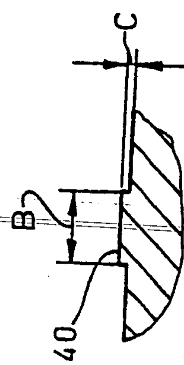

FIG. 4

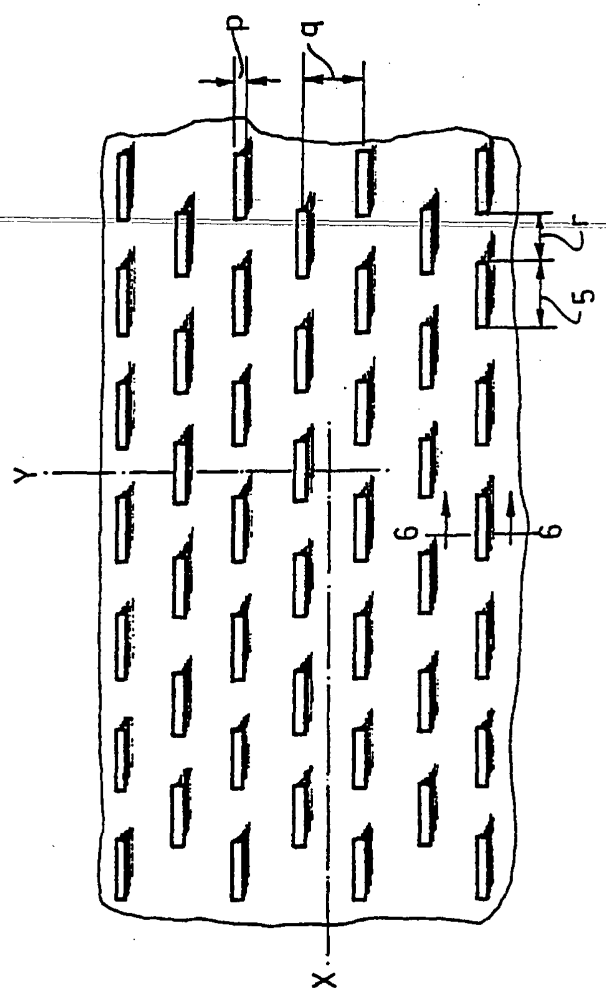

FIG. 5

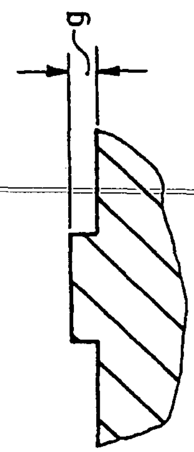

FIG. 6